# PROJECT FACT SHEET

**CONTRACT TITLE:** Anisotropy and Spatial Variation of Relative Permeability and Lithologic Character of Tensleep Sandstone Reservoirs in the Bighorn and Wind River Basins, Wyoming

**ID NUMBER:** DE-AC22-93BC14897

**B & R CODE:** AC1005000

**DOE PROGRAM MANAGER:**
**NAME:** George J. Stosur
**PHONE:** (301) 903-2749

**DOE PROJECT MANAGER:**
**NAME:** Robert E. Lemmon
**LOCATION:** NPTO
**PHONE:** (918) 337-4405

**PROJECT SITE**
**CITY:** Laramie **STATE:** WY
**CITY:** **STATE:**
**CITY:** **STATE:**

**CONTRACTOR:** University of Wyoming
Office of Research
**ADDR:** P.O. Box 3355

Laramie, WY 82071

**CONTRACT PROJECT MANAGER:**
**NAME:** Thomas L. Dunn
**PHONE:** (307) 766-2782
**FAX:** (307) 766-2737
**INTERNET ADDRESS:** tldunn@uwyo.edu

**CONTRACT PERFORMANCE PERIOD:**
09/15/1993 to 01/15/1997

**PROGRAM:** Supporting Research
**RESEARCH AREA:** Rsvr Characterization

| FUNDING ($1000'S) | DOE | CONTRACTOR | TOTAL |
|---|---|---|---|
| PRIOR FISCAL YRS | 749 | 187 | 936 |
| FISCAL YR 1997 | 0 | 0 | 0 |
| FUTURE FUNDS | 0 | 0 | 0 |
| TOTAL EST'D FUNDS | 749 | 187 | 936 |

**OBJECTIVE:** The study will provide improvements to enhanced oil recovery in sandstone reservoirs by developing an understanding of both the spatial variation in reservoir quality with varying water saturations and the dynamic alteration caused by rock-fluid interaction during $CO_2$ enhanced oil recovery processes.

**METRICS/PERFORMANCE:**
**Products developed:** This project will result in reduced completion and workover costs associated with both $CO_2$ and directional drilling in the Tensleep Formation. Incremental recovery from the Tensleep due to improvements to technology are estimated in the 10's to 100's mmbls oil.

**PROJECT DESCRIPTION:**

**Background:** The Tensleep Sandstone, at present, produces more oil than any other formation in the State of Wyoming, providing 19% of the annual production. The Tensleep Sandstone offers the largest EOR target in the state. Hence, the greatest impact on hydrocarbon production and the state revenues generated from that production will come from improvements in extraction technologies aimed at the Tensleep Sandstone and eolian deposits in general. Research will be conducted to improve the predictability of wellbore damage and formation alteration that can accompany CO2 enhanced oil recovery processes. Because the Tensleep Sandstone contains fluids with large chemical compositional variations, such predictability will be improved by (1) examination of the variations present in the producing region, (2) chemical modeling of those fluids during a CO2 flood, and (3) experimental verification of the types and extent of wellbore damage and formation alteration. There is a need for evaluation criteria to guide operators during consideration of the potential problems of CO2 flood treatments. This project is directed towards providing this technology.

**Work to be performed:** This is a multidisciplinary study designed to provide improvements in advanced reservoir characterization techniques in the form of: (1) an examination of the spatial variation and anisotropy of relative permeability in the Tensleep Sandstone reservoirs of Wyoming; (2) the placement of that variation and anisotropy into depositional subfacies, paleogeographic, and burial diagenetic frameworks, thus providing larger scales of investigation; (3) the development of pore system imagery techniques for the calculation of relative permeability; and (4) reservoir simulations testing the impact of relative permeability anisotropy and spatial variation on Tensleep Sandstone reservoir enhanced oil recovery. Additional work is aimed at understanding the spatial dynamic alteration that occurs in sandstone reservoirs as a result of rock-fluid interaction during CO2 enhanced oil recovery processes, and how this effects relative permeability, wettability, and pore structure.

**PROJECT STATUS:**

**Current Work:** The project is fully staffed and on schedule.

**Scheduled Milestones:**

| | |
|---|---|
| Run initial reservoir simulations using relative permeability anisotropy data | 10/95 |
| Complete third CO2 coreflood experiment | 11/95 |
| Identify key subsurface features | 11/95 |
| Identify and sample key lithologies and sedimentary features | 01/96 |

**Accomplishments:** (1) Reservoir flow units have been identified and their dimensions described using Formation MicroScanner log analysis, (2) Computer simulations of Tensleep dunes have been made that make it possible to model the distribution of flow units within the reservoir and better predict fluid-flow patterns. (3) These results have been applied in improving Tensleep horizontal well drilling program design. (4) Reservoir computer simulations of horizontal well production indicates that relative permeability anisotropy is a governing control on Tensleep post-waterflood recovery. (5) A website for rapid technical transfer of project results and updates was established: (http://garfield.uwyo.edu/doe/tensleep.html)